

## FLUID POWERED BUBBLE MACHINE WITH SPILL-PROOF CAPABILITY

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This application is a continuation of application Ser. No. 08/608,854 filed Feb. 29, 1996, which was a continuation-in-part of application Ser. No. 08/086,541 filed Jul. 1, 1993 and since issued Mar. 5, 1996 as U.S. Pat. No. 5,495,876 which was a continuation-in-part of application Ser. No. 07/828,345 filed Jan. 30, 1992 and since issued Sep. 21, 1993 as U.S. Pat. No. 5,246,046. The benefit of the filing date of this earlier filed application is claimed under 35 U.S.C. § 120.

### BACKGROUND OF THE INVENTION

The present invention relates to improved machines for blowing bubbles as well as to improved machines for providing water spray for amusement. The invention has particular application for use with bubble solution of the type used by children in blowing bubbles.

It is well known that bubble machines have existed for some time and are commercially available in a variety of embodiments. Prior to applicant's co-pending application, and other applications by applicant which have matured into U.S. patents, these bubble machines have been of a type and geometry which provided no resistance to spillage of liquid contents of the machine. In addition, a variety of water toys have long existed that provide an amusing spray of water as well as activate movement of cartoon characters or cause the cartoon characters to spray water.

### SUMMARY OF THE INVENTION

The present invention relates to an improved fluid powered bubble machine having various impellers, fans, axles and gear working in combination and wherein water from a source such as a garden hose activates the bubble machine to generate a continuous stream of bubbles. The machine can be used in combination with a sprinkler to generate both a stream of bubbles from one end on the machine, and a stream of water from the other end. In different embodiments of the present invention, selective channeling of the sprinkler portion of the bubble machine creates amusing and intermittent streams of water. In some instances, only the bubble portion of the machine is in use and the sole result is a pleasing, continuous stream of bubbles. In other instances, only the sprinkler portion of the machine is in use and the sole result is the generation of streams of water useful for either water play or for watering the lawn or other vegetation. In yet another embodiment, the water sprinkling portion of the apparatus has a non-fluid powered bubble machine, such as a battery powered bubble machine mounted on top. In its ideal use, both the sprinkler and bubble portion of the bubble machine are in use resulting in both a continuous stream of bubbles and streams of water, thereby maximizing the pleasure potential and utility of the invention.

In a preferred embodiment of the present invention, the fluid powered bubble machine comprises an impeller housing which encloses an impeller and which has a threaded opening for connection to a standard garden hose. On one side wall of the housing is another opening that forms a channel for providing fluid communication between the inner cavity of the housing and a fluid tank. Water flowing into the bubble machine from the garden hose or other water source flows past the impeller causing the impeller to act as a hydraulic motor which powers other portions of the bubble machine which are described below. In the preferred

embodiment, a hollow cylinder is provided for rotation within the fluid tank. The hollow cylinder rotates in response to torque from the hydraulic motor and causes a constantly changing portion of ports to be alternately open and closed. This, in turn, causes the water streams to be intermittent. Throughout the rotation cycle of the hollow cylinder, there are always one or more ports in the open position, so as to allow the water to flow continuously. After flowing past the impeller, the water flows into the hollow cylinder within the fluid tank and is ported out via a plurality of channels that guide the water into streams emanating radially outward and upward from the fluid tank.

On a second side wall of the impeller housing is a sealed, second opening for a geared axle. The axle is attached to the impeller at one end thereof, and is rotatably connected to a second impeller or fan. While the second impeller is not hydraulically ported to the hydraulic motor, torque from the hydraulic motor rotates the geared axle causing the second impeller to turn. Rotation of the second impeller generates an air stream. A bubble solution container is attached to the upper end of the bubble machine. The bubble solution container has an opening in the top surface and a funnel depending from the top surface into the inner cavity of the container. A bubble wheel, having bubble openings at the periphery of the bubble wheel, is positioned within the funnel and is rotatably connected to an extension of the geared axle. Rotation of the geared axle thus synchronously rotates both the second impeller and the bubble wheel. The diameter of the bubble wheel is sufficiently large such that an upper portion of the bubble wheel is continuously outside of the bubble container and is thereby exposed to the continuous air stream generated by the rotation of the second impeller. When a thin film of bubble solution adheres to the bubble openings at the periphery of the bubble wheel, the continuous air stream generated by the second impeller creates a continuous stream of bubbles.

Accordingly, in the preferred embodiment of the present invention wherein both the bubble machine and the sprinkler portion are in operation, it is an object of the present invention to provide a fluid powered bubble machine with spill-proof capability by connecting the lower impeller housing spout to a pressurized fluid or water source. The water will turn the impeller, exit the impeller housing through the upper impeller housing spout, enter the fluid tank through the fluid tank attach spout, fill and pressurize the fluid tank, exit through one or more aligned fluid passage holes and fluid passage slots, and create amusing streams of water. In response to the rotation of the impeller, the impeller forward gear will turn the fluid drum gear. Turning of the fluid drum gear will cause various fluid passage holes and fluid passage slots to constantly align and misalign in a predetermined or random pattern. The rotating rearward impeller gear will cause the coupled female fan gear and fan to rotate. Rotation of the fan creates an air stream directed at the bubble wheel. Rotation of the fan, fan axle, and male fan gear also causes rotation of the bubble wheel through the bubble trough. A plurality of bubble orifices placed on the outer periphery of the bubble wheel thus rotates into the bubble trough, picks up a thin film of bubble solution, continues its rotation within the rectangular funnel until the bubble orifices are protruding outside of the container. The air stream "blows" bubbles with the bubble film thereby vacating the bubble orifices. Continued rotation of the bubble wheel results in a continued exposure of bubble film to the air stream.

### DESCRIPTION OF DRAWINGS

The objects and many attendant advantages of this invention will be readily appreciated and become readily apparent

as the same becomes better understood by reference to the following detailed description, when considered in conjunction with the accompanying drawings and in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is an isometric assembly view of the bubble machine (rotated 90 degrees counterclockwise to facilitate a larger scale figure). The front right portion of the solution container shells, lower impeller housing, and fluid tank are shown cut away. The right portion of the upper impeller housing and fluid drum (except for part of the fluid drum gear) are also shown cut away.

FIG. 2A is an exploded isometric view of the various parts that make up the bubble machine and illustrates their relationship to each other. The portions shown cut away, are identical to that shown in FIG. 1.

FIG. 2B is an enlarged view of the bubble machine base shown in FIG. 2A.

FIG. 2C is an enlarged view of the fluid tank shown in FIG. 2A.

FIG. 4 is a sideways oriented enlargement of the bubble solution container portion of the bubble machine of FIG. 3. The bubble solution is shown retained in the top of the upper shell.

FIG. 5 is an inverted enlargement of the bubble solution container portion of the bubble machine of FIG. 3. The bubble solution is shown retained in the front portions of the upper and lower container shells.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In order to facilitate the understanding of the present invention in reviewing the drawings accompanying the specification, a feature list is provided below. It is noted that like features are like numbered throughout all of the figures.

FEATURE TABLE

Number	Feature	Number	Feature
10	Bubble machine assembly	74	Impeller forward axle
12	Forward end of assembly	76	Impeller rearward axle
14	Rearward end of assembly	78	Impeller blade
20	Bubble machine base	80	Fan
22	Attach pin - machine base	82	Fan axle
24	Attach pin - machine base	83	Forward retaining flange - fan axle
26	Attach pin - machine base	84	Forward retaining flange - fan axle
30	Fluid tank	86	Male fan gear
32	Fluid passage hole - fluid tank	87	Female fan gear
34	Attach receptacle - fluid tank	88	Fan blade
35	Attach spout - fluid tank	90	Bubble Wheel
36	Attach spout rearward edge - fluid tank	92	Bubble orifice
38	Attach spout inner surface - fluid tank	94	Bubble wheel axle
40	Fluid drum	96	Retaining flange - bubble wheel
41	Fluid drum open end	98	Bubble wheel gear
42	Fluid drum gear	100	Lower solution container shell
44	Inner gear surface - fluid drum	102	Bubble solution trough - lower shell
46	Fluid passage slot - drum fluid	104	Connecting flange - lower shell
50	Lower impeller housing	106	Attach receptacle - lower shell
52	Attach receptacle - lower impeller housing	108	Fill slot
54	Spout - lower impeller housing	110	Upper solution container shell
56	Axle retaining slot - lower impeller housing	112	Panel - upper shell
58	Stop - lower impeller housing	114	Panel upper opening - upper shell
60	Upper impeller housing	116	Panel lower opening - upper shell
61	Upper impeller housing spout	118	Axle retaining slot - flange
62	Stepped spout edge - upper impeller housing	120	Connecting flange - upper shell
64	Outer spout surface - upper impeller housing	122	Fan axle trough - upper shell
66	Axle retaining slot - upper impeller housing	124	Forward fan axle retaining flange - upper shell
68	Stop - upper impeller housing	125	Rearward fan axle retaining flange - upper shell
70	Impeller	126	Upper shell fill slot
71	Impeller forward gear	130	Cap
72	Impeller rearward gear	140	Bubble solution level

FIG. 2D is an enlarged view of the fluid drum shown in FIG. 2A.

FIG. 2E is an enlarged view of the impeller housings and impeller shown in FIG. 2A.

FIG. 2F is an enlarged view of the fan and bubble wheel shown in FIG. 2A.

FIG. 2G is an enlarged view of the solution container shells shown in FIG. 2A.

FIG. 3 is an orthographic side view of the bubble machine. The portions shown cut away are the same as in FIG. 1 except that the bubble drum gear is not cut away. The bubble solution is shown retained in the bottom of the lower shell.

Referring now to the drawings and particularly to FIGS. 5 and 2, the invention is a machine 10 that comprises a base 20, a fluid tank 30, a fluid drum 40, a lower impeller housing 50, an upper impeller housing 60, an impeller 70, a fan 80, a bubble wheel, a lower solution container shell 100, an upper solution container shell 110, and a cap 130. The machine 10 has a forward end 12 and a rearward end 14. Base 20 comprises a support base with a plurality of attach pins 22, 24, and 26. The preferred embodiment of the present invention will now be described by further reference to the figures.

As can be seen from FIG. 2C, fluid tank 30 contains a plurality of fluid passage holes 32, an attach receptacle 34, and an attach spout 35. Attach receptacle 34 is adapted to

snappingly attach to and be supported by attach pin 22. Rearward edge 36 of attach spout 35 bears against the impeller housing stepped edge 62, and the inner surface 38 of attach spout 35 connects with outer surface 64 of upper impeller housing spout 61.

FIG. 2D shows fluid drum 40 having an open end 41, a gear 42, an inner gear surface 44, and a plurality of fluid passage slots 46. Fluid drum 40 is adapted to reside on and rotate about fluid tank 30. The inner gear surface 44 is adapted to allow attach spout 35 and attach spout 61 to be in coupling engagement within and to pass through the inner gear surface 44.

As can be seen from FIG. 2E, an impeller housing is defined by a lower impeller housing 50 and an upper impeller housing 60. Lower impeller housing 50 is further defined as having an attach receptacle 52, a spout 54, an impeller axle retaining slot 56, and a stop 58. The attach receptacle 52 is adapted to snappingly attach to and supported by attach pin 24. Upper impeller housing 60 is further defined as having a spout 61, a stepped spout edge 62, a spout outer surface 64, an axle retaining slot 66, and a stop 68. The lower impeller housing 50 and the upper impeller housing 60 are adapted to snappingly engage one to another to form a complete impeller housing.

As can also be seen from FIG. 2E, an impeller 70 has a forward gear 71, a rearward gear 72, a forward axle 74, a rearward axle 76, and a plurality of impeller blades 78. Impeller 70 is adapted to be retained by and be rotatable within lower impeller housing 50 and upper impeller housing 60 when the impeller housings are in coupling engagement with one another by means of the impeller axles 74 and 76 being retained by axle retaining slots 56 and 66.

As shown in FIG. 2F, a fan 80 is provided having fan axle 82, a rearward fan axle retaining flange 83, a forward fan axle retaining flange 84, a male fan gear 86, a female fan gear 87, and a plurality of fan blades 88.

Also shown in FIG. 2F, a bubble wheel 90 has a plurality of bubble orifices 92 about the outer periphery, a bubble wheel axle 94 at the center, at least one bubble retaining flange 96 on the end of the bubble wheel axle 94, and a bubble wheel gear 98. The male fan axle 86 is adapted to mesh with and provide torque to bubble wheel gear 98.

FIG. 2G shows a bubble solution container having a lower solution container shell 100 and an upper solution container shell 110. The lower solution container shell 100 is further defined as a shell having a bubble solution trough 102, a connecting flange 104, an attach receptacle 106, and a fill line 108. The attach receptacle 106 is adapted to snappingly attach to and supported by base attach pin 26.

As is also shown in FIG. 2G, the upper solution container shell 110 is further defined as a shell having a funnel 112, a upper funnel opening 114, a lower funnel opening 116, bubble wheel axle retaining slots 118, a connecting flange 120, a fan axle trough 122, fan axle retaining flanges 124 and 125, and a filling spout 126. The lower solution container shell 100 and upper solution container shell 110 are adapted snappingly attach together by connecting flanges 104 and 120. The fill spout 126 is adapted to threadingly attach to a cap 130. The bubble wheel axle retaining flange 118 is adapted to snappingly attach to and support rotation of the bubble wheel axle 94. The fan axle retaining slots 124 and 125 are adapted to snappingly attach to and support rotation of fan axle 82.

The operation of the present invention can be seen by reference to FIG. 1. When a pressurized fluid source is connected to the lower impeller housing spout 54, the fluid

will cause the impeller 70 to rotate by creating a pressure differential on the impeller blades. As impeller 70 rotates, male impeller gear 72 that is coupled to female fan gear 87 causes the fan 80 to rotate. The rotation of impeller 70 also causes impeller forward gear 71 which is meshed with fluid drum gear 42 to rotate the fluid drum. The rotation of fan 80 causes fan blades 88 to generate an air flow in the direction of bubble wheel 90. As fan 80 rotates, male fan gear 86 that is meshed with bubble wheel gear 98 causes bubble wheel 90 to rotate. The rotation of bubble wheel 90 causes bubble orifice 92 to continuously travel through and be immersed in bubble solution in bubble solution trough 102, to travel above funnel upper opening 114, and to expose refreshed bubble orifice 92 to the air stream, thus creating bubbles. After entering through lower impeller housing spout 54 and rotating impeller 70, the pressurized fluid exits upper impeller housing 60 through upper impeller housing spout 61 and simultaneously enters fluid drum 40 through fluid drum attach spout 35.

After entering and pressurizing fluid tank 30, the fluid exits the fluid tank through one or more fluid passage holes 32 and through one or more fluid passage slots 46 and sprays outward. Fluid tank 30 and fluid drum 40 are adapted such that at any given point in the bubble creation cycle and the fluid flow and spray cycle, at least one fluid passage hole 32 and at least one fluid passage slot 46, will always be lined up with one another so to create a constant fluid flow path.

As can be seen by reference to FIG. 2, bubble wheel gear 98 has a diameter less than the diameter of the bubble wheel 90. The bubble wheel 90 is prevented from inadvertently becoming detached from bubble wheel axle retaining slots 118 by bubble wheel axle retaining flanges 96. Retaining flanges 96 also act to keep bubble wheel 90 from rubbing against the sides of funnel 112. Bubble solution is poured into the interior of upper container shell 110 through fill spout 126 to a predetermined level as indicated by fill line 108. The maximum fill line 108 is placed no higher on lower shell 100 than to equal the volume defined by the maximum liquid that can be held in the machine without running out of funnel 112 when oriented in any position.

FIGS. 3-5 illustrate the additional unique advantages of spill resistance when fluid is filled at or below the fill line 108 in the subject invention regardless of the various possible orientations. As is apparent from FIG. 3, when the invention is in the upright position liquid will always be below the lower edge 116 of funnel 112. When machine 10 is in the upside down position as in FIG. 4, the liquid will occupy the space immediately around funnel 112 but not be able to enter funnel 112 for discharge through opening 114. When machine 10 is in a sideways position as in FIG. 5, the liquid level will always be between the side of the funnel 112 and the lower side of the two container shells 100 and 110. Furthermore, when the machine 10 is oriented in any of an infinite variations of the above described positions, it will behave in a like manner and prevent the spillage of the solution.

As is seen by reference to FIGS. 1 and 2, in the preferred embodiment, the fluid powered bubble machine of the subject invention is mounted on a base with bubbles being blown from one end and fluid emanating from the other. However, other embodiments of the subject invention could readily be adapted to have the fluid emanate from a vertical fluid tank and the bubble blowing portion of the machine could be mounted above the fluid tank so as to increase the elevation of the bubbles being blown. The entire machine could also be readily adapted to take the form of a fire hydrant, a cartoon character, or other aesthetically pleasing shape.